

**TOSHIBA**

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(TOTAL SHEETS 33) REV[00]

購入仕様書 PURCHASE SPECIFICATION**名称 TITLE SEC46Edge-LED Slim & Narrow Panel**

仕様書の構成を「購入仕様書」と付帯資料「購入仕様書および図面の一般要求事項」(*)とし、セットで運用します。
双方とも常に最新版をご使用くださるよう、ご留意願います。

注(*)「購入仕様書および図面の一般要求事項」 技術資料番号: 360044583

The specifications consist of "Purchase Specifications" and its appendix document "General Requirements on Purchase Specifications and Drawings"(*), and they will be treated as a set from now on. Kindly ensure you are using the latest versions of both.

Note (*) "General Requirements on Purchase Specifications and Drawings". Technical Document number: 360044583

変更記録

RECORDS OF THE REVISION

変更回数 REV.	日付 DATE	変更箇所・変更内容 DESCRIPTION	事業場・部門 DIV-DEPT.	承認 APROVED	調査 CHECKED	担当 PREPARED
00	SIGNED TO SYSTEM	新規発行 NEW ISSUED	[映像設3] (3映設1)	SIGNED TO SYSTEM	SIGNED TO SYSTEM	HIROYUKI ONO

対象 V コード / メーカー / 形名 一覧**V-Code / Maker / Type Name Inspect**

V-Code	Maker	Type Name	V-Code	Maker	Type Name
V33A00036500	SME	LTA460HJ11			

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Approval

Model No. :

Parts Code : V33A00036500

Customer : Toshiba**DATE : 23. July. 2010****SAMSUNG TFT-LCD****MODEL : LTA460HJ11**

NOTE :

Customer's Approval		APPROVED BY <i>Jeong min Heo</i>	DATE 23.July.2010
SIGNATURE	DATE	PREPARED BY <i>Seungil . Lee</i>	DATE 23.July.2010

LCD Business

Samsung Electronics Co . , LTD.

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**Samsung Secret***** Revision History**

Date	Rev. No	Page	Summary
June 18, 2010	001	all	First Issued
June 28, 2010	002	4, 24	Module Weight 11,300g → 11,100g (Total Pallet Weight 197.5kg → 194.5kg)
		20	50msec ≤ T2 → 0 < T2 ≤ 50msec
		23	Pallet 10EA → Pallet 15EA
July 23, 2010	003	6	Revised Absolute Vf Max (209V → 213V)
		11	Revised Vf (Min 188, Typ 199, Max 209 → Min 193, Typ 203, Max 213)
		22	Updated Outline Dimension Rear

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General Description

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Description

LTA460HJ11 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 46.0" is 1920 x 1080 and this model can display up to 1.07 Billion colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV

Features

- RoHS compliance (Pb-free)
- High contrast ratio & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle ($\pm 178^\circ$)
- High speed response (& Natural Motion (DFR: Double Frame Rate))
- FHD resolution (16:9)
- Low Power consumption
- Edge Type LED (Light Emitted Diode) BLU
- DE (Data Enable) mode
- 4ch LVDS (Low Voltage Differential Signaling) interface (4pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	1056.5 (H _{TYP}) *610.8(V _{TYP})	mm	±1.0mm
	26.9(D _{MAX})		
Weight	11,100	g	
Pixel Pitch	0.53025(H) x 0.53025(W)	mm	
Active Display Area	1018.08(H) x 572.67(V)	mm	
Surface Treatment	Haze 0 %, Hard Coating 3H		
Display Colors	8 bit + FRC – 1.07 Billion	colors	
Number of Pixels	1920 x 1080	pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Luminance of White	450 (Typ.)	cd/m ²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

1.1 TFT LCD Module Absolute Maximum Ratings

 $(V_{DD}=12V)$

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	GND-0.5	13.2	V	(1)
Storage temperature	T_{STG}	-20	60	°C	(2)
Operating temperature	T_{OPR}	0	50	°C	
Surface temperature	T_{SUR}	0	65	°C	(3)
Shock (non - operating)	S_{NOP}	X,Y	-	40	G
		Z	-	30	
Vibration (non - operating)	V_{NOP}	-	1.5	G	(5)

Note (1) $T_a = 25 \pm 2$ °C

(2) Temperature and relative humidity range are shown in the figure below.

a. 90 % RH Max. ($T_a \leq 39$ °C)

b. Relative Humidity is 90% or less. ($T_a > 39$ °C)

c. No condensation

(3) Although abnormal visual problems can be occurred in T_{SUR} range, the polarizer is not damaged in this range.

(4) 11ms, sine wave, one time for $\pm X$, $\pm Y$, $\pm Z$ axis

(5) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

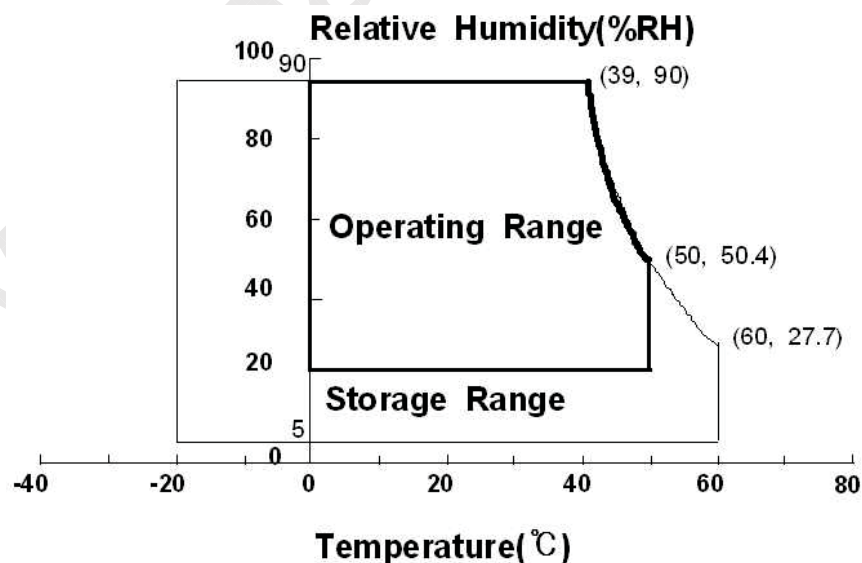


Fig. Temperature and Relative humidity range

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1.2 LED Bar Unit Absolute Maximum Ratings

Item	Symbol	Max.	Unit	Note
Operating Temperature Range	T_{op}	-20~+70	°C	
Storage temperature Range	T_{STG}	-30~+70	°C	
Junction Temperature	T_j	110	°C	LED package
Forward Current	I_f	0.16	A	Continuous operation @String (1 String/PCB)
Forward Voltage	V_f	213	V	62 LEDs / @95mA @ T_j 25°C
Thermal Resistance, Junction to Solder	$R_{th,JS}$	40K/W	K/W	LED package

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2. Optical Characteristics

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The optical characteristics should be measured in a dark room or equivalent.

Measuring equipment : TOPCON RD-80S, TOPCON SR-3, ELDIM EZ-Contrast

(Ta = 25 ± 2°C, VDD=12V, fv= 120Hz, f_{DCLK} = 297.0MHz, LED Current = 95mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		4,000	5,000	-		(1) SR-3
Response Time	G-to-G	Tg	Normal q _{L,R} =0 q _{U,D} =0 Viewing Angle	-	5	-	msec	(3) RD-80S
Luminance of White (Center of screen)		Y _L		360	450	-	cd/m ²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	R _x		TYP. -0.03	0.628	TYP. +0.03		(5),(6) SR-3
		R _y			0.333			
	Green	G _x			0.323			
		G _y			0.623			
	Blue	B _x			0.155			
		B _y			0.044			
	White	W _x			0.280			
		W _y			0.290			
Color Gamut		-	-	72	-	%	(5) SR-3	
Color Temperature		-	-	10,000	-	K		
Viewing Angle	Hor.	q _L	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		q _R		75	89	-		
	Ver.	q _U		75	89	-		
		q _D		75	89	-		
White Brightness Uniformity (9 Points)		B _{uni}		-	-	25	%	(2) SR-3

- Test Equipment Setup

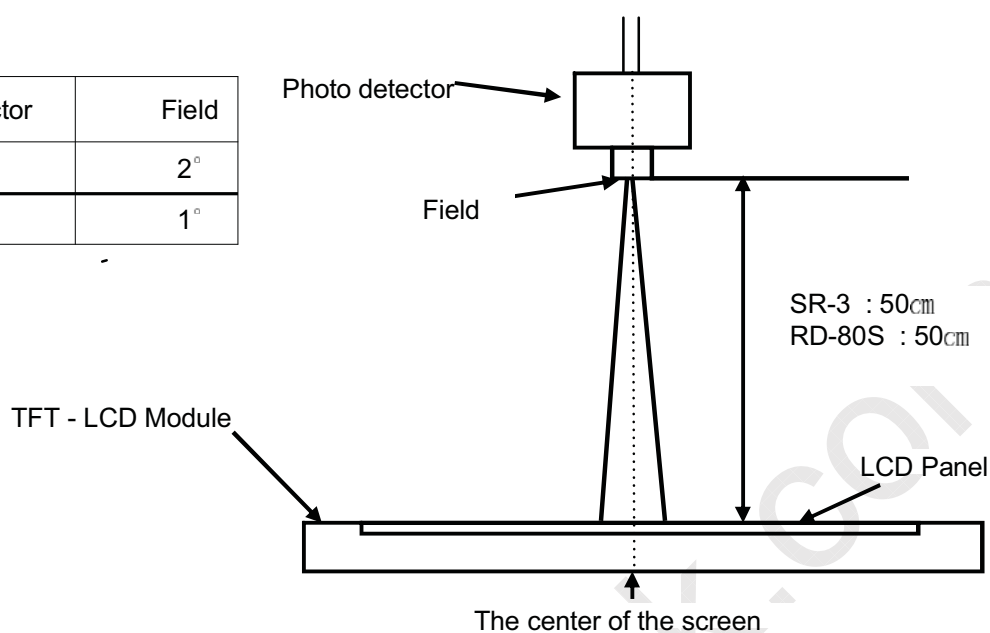
The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

Environment condition : Ta = 25 ± 2 °C

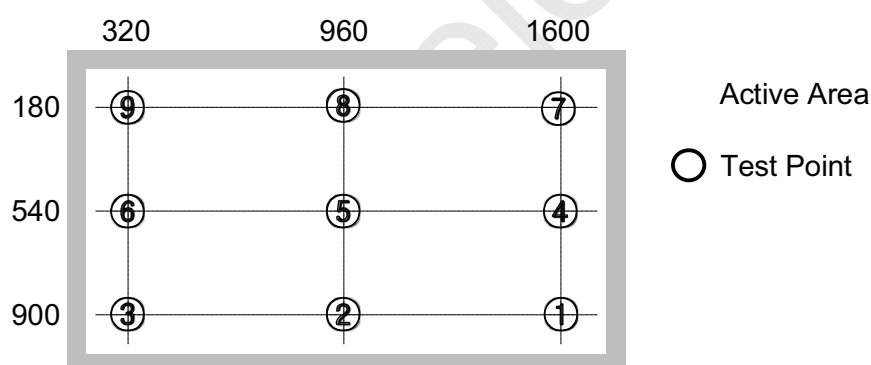
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Photo detector	Field
SR-3	2°
RD-80S	1°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G_{\max}}{G_{\min}}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

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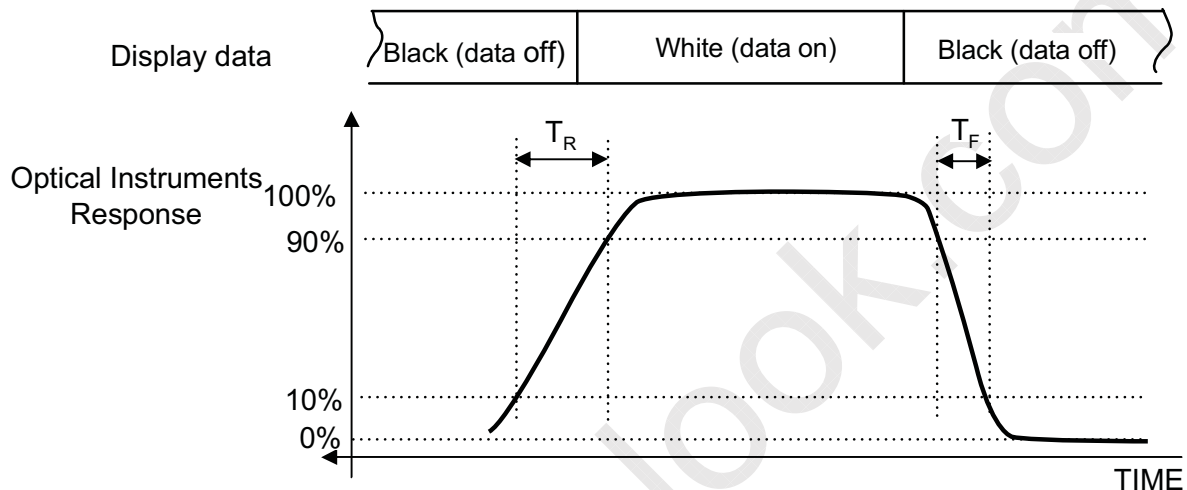
Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$B_{uni} = 100 * \frac{(B_{max} - B_{min})}{B_{max}}$$

Bmax : Maximum brightness

Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf



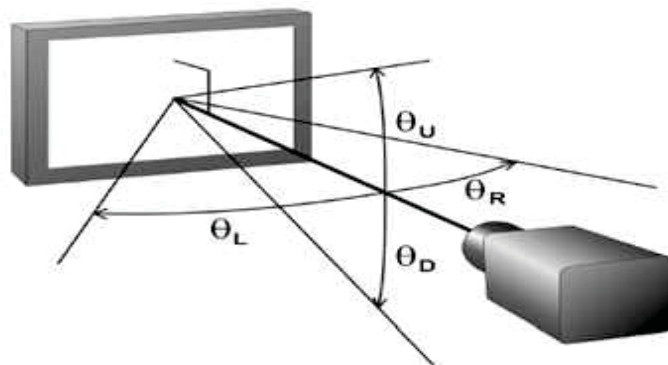
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle

: Viewing angle range (C/R ≥ 10)



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3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

$T_a = 25^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V _{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I _{DD}	-	560	-	mA	(2),(3)
	(b) White		-	540	-	mA	
	(c) Sub V-Stripe		-	1100	1400	mA	
Vsync Frequency		f _V	95.0	120.0	125.0	Hz	
Hsync Frequency		f _H	120.0	135.0	140.0	kHz	
Main Frequency		f _{DCLK}	260.0	297.0	305.0	MHz	
Rush Current		I _{RUSH}	-	-	6	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD} .

(2) $f_V=120\text{Hz}$, $f_{DCLK} = 297.0\text{MHz}$, $V_{DD} = 12.0\text{V}$, DC Current.

(3) Power dissipation check pattern (LCD Module only)

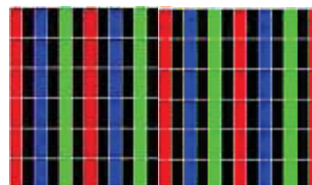
a) Black Pattern



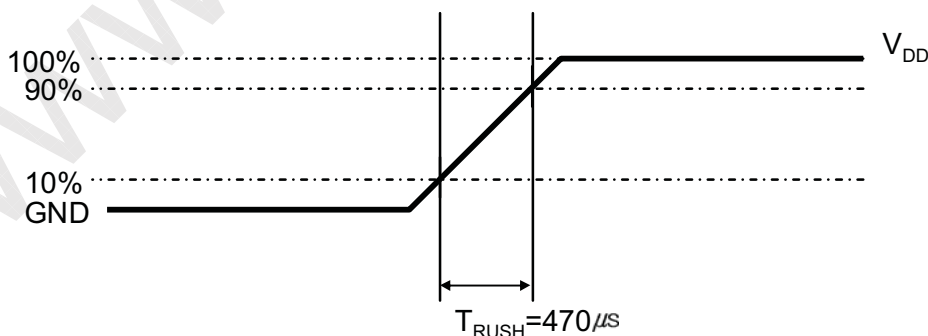
b) White Pattern



c) Sub V-Stripe



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is $470\mu\text{s}$.

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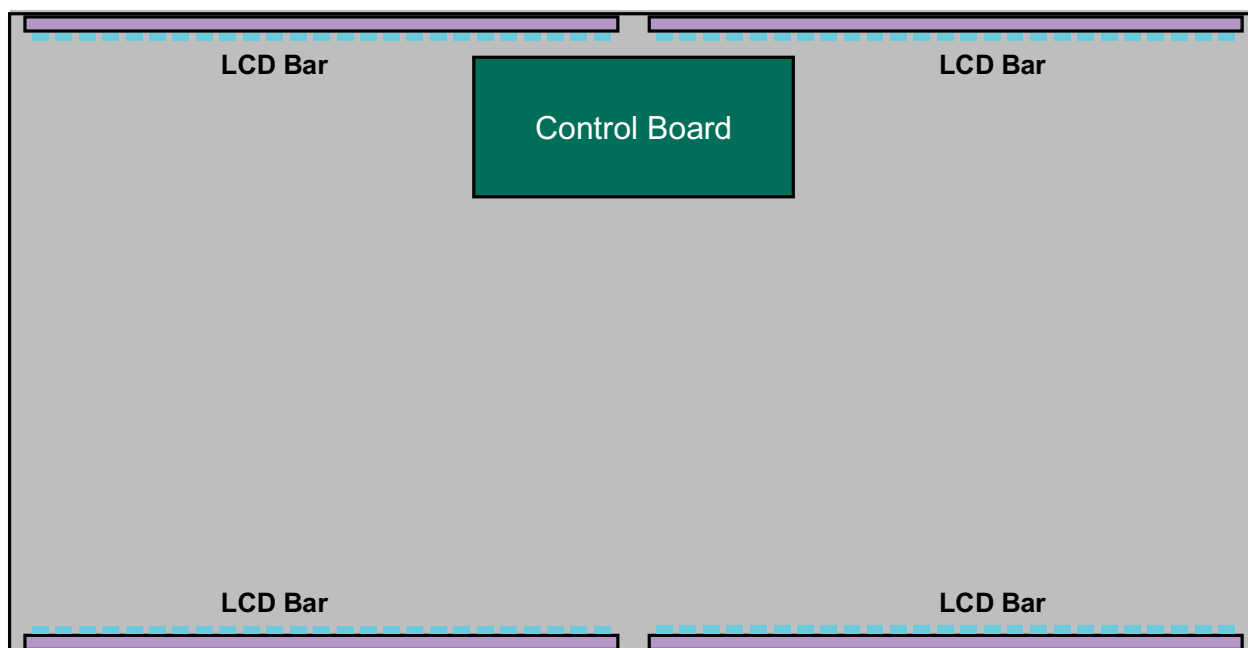
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3.2 Back Light Unit

The back light unit contains Edge type White LEDs (Light Emitting Diode)

$T_a = 25 \pm 2^\circ\text{C}$



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	-	43,000	-	Hour	(1),(2)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value. [Operating condition : $T_a = 25 \pm 2^\circ\text{C}$, For LED Package only.]

(2) Test Condition : $T_j 80^\circ\text{C}$, 120mA, 3,000Hr

3.3 LED Bar Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	V_f	193	203	213	V	@95mA/Bar@ $T_j = 25^\circ\text{C}$
Variation of V_f	ΔV_f	-	-	7	V	4Bar @ 1 BLU

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4. Input Terminal Pin Assignment

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4.1.1 Input Signal & Power

Connector : FI-RE41S-HF (JAE/UJU)

Pin	Description		Pin	Symbol	Description
1	Vdd(12V)		21	ODD LVDS SIGNAL	Rx1[3]P
2	Vdd(12V)		22		Rx1[4]N
3	Vdd(12V)		23		Rx1[4]P
4	Vdd(12V)		24		GND
5	Vdd(12V)		25		Rx3[0]N
6	No Connection		26		Rx3[0]P
7	GND		27		Rx3[1]N
8	GND		28		Rx3[1]P
9	GND		29		Rx3[2]N
10	ODD LVDS SIGNAL	Rx1[0]N	30		Rx3[2]P
11		Rx1[0]P	31		GND
12		Rx1[1]N	32		Rx3CLK-
13		Rx1[1]P	33		Rx3CLK+
14		Rx1[2]N	34		GND
15		Rx1[2]P	35		Rx3[3]N
16		GND	36		Rx3[3]P
17		Rx1CLK-	37		Rx3[4]N
18		Rx1CLK+	38		Rx3[4]P
19		GND	39	GND	
20		Rx1[3]N	40	No Connection	
			41	No Connection	

Note) No Connection: This PINS are only used for SAMSUNG internal using.

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4.1.2 Input Signal & Power

Connector : FI-RE51S-HF (JAE/UJU)

Pin	Description		Pin	Description	
1	Vdd(12V)		26	EVEN LVDS SIGNAL	Rx4[0]P
2	Vdd(12V)		27		Rx4[1]N
3	Vdd(12V)		28		Rx4[1]P
4	Vdd(12V)		29		Rx4[2]N
5	Vdd(12V)		30		Rx4[2]P
6	No Connection		31		GND
7	GND		32		Rx4CLK-
8	GND		33		Rx4CLK+
9	GND		34		GND
10	EVEN LVDS SIGNAL	Rx2[0]N	35		Rx4[3]N
11		Rx2[0]P	36		Rx4[3]P
12		Rx2[1]N	37		Rx4[4]N
13		Rx2[1]P	38		Rx4[4]P
14		Rx2[2]N	39	GND	
15		Rx2[2]P	40	No Connection	
16		GND	41	No Connection	
17		Rx2CLK-	42	No Connection	
18		Rx2CLK+	43	No Connection	
19		GND	44	No Connection	
20		Rx2[3]N	45	LVDS Option * Note(1)	
21		Rx2[3]P	46	No Connection	
22		Rx2[4]N	47	No Connection	
23		Rx2[4]P	48	No Connection	
24		GND	49	No Connection	
25		Rx4[0]N	50	No Connection	
			51	No Connection	

NOTE) No connection : This Pins are only used for SAMSUNG internal using

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Note) Pin number starts from Right side

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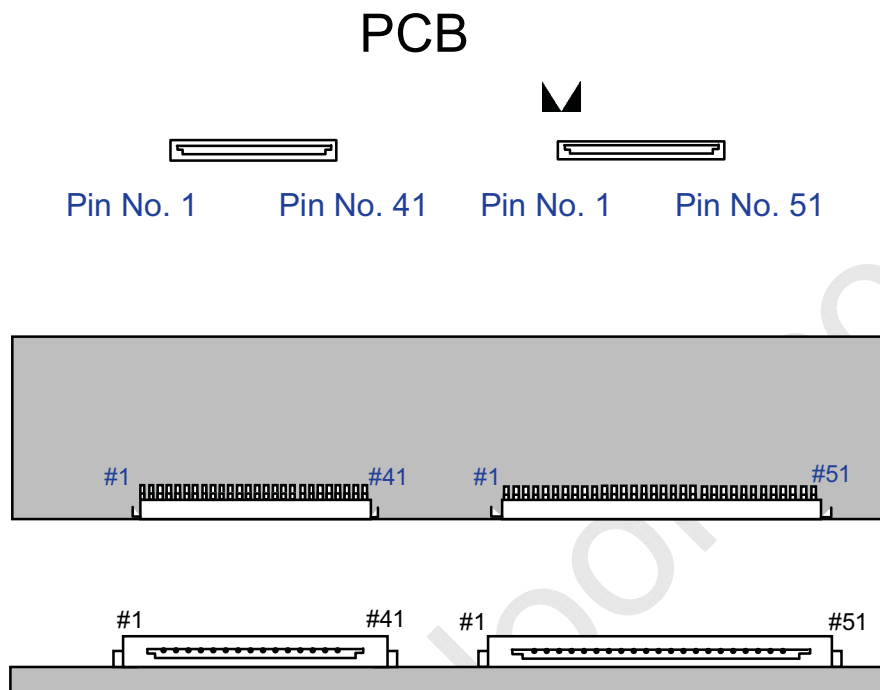
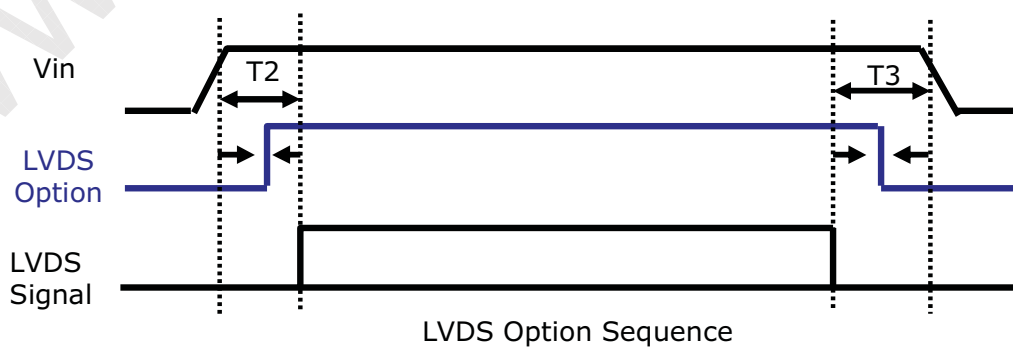


Fig. Connector diagram

- a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
- b. All power input pins should be connected together.
- c. All NC pins should be separated from other signal or power.

Note(1) LVDS OPTION : If this PIN HIGH (3.3V) → Normal LVDS format
LOW (GND) → JEIDA LVDS format

SEQUENCE : On = VDD(T1) → LVDS Option → Interface Signal(T2)
OFF = Interface Signal(T3) → LVDS Option → VDD



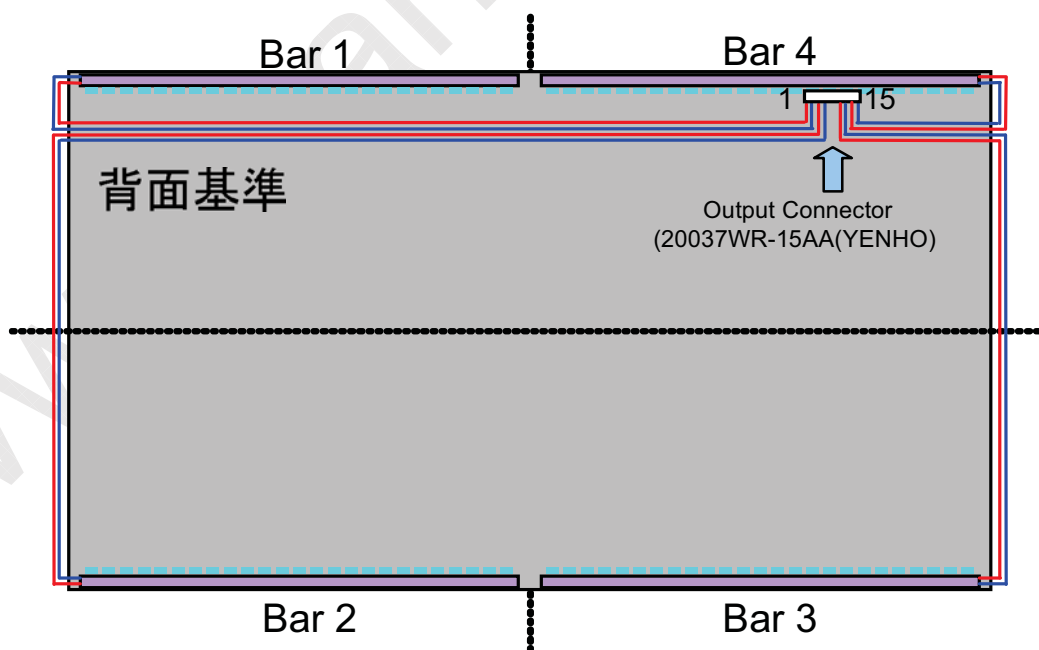
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4.2 LED Output Pin Configuration

Connector : 20037WR-15AA(YENHO)

PIN NO.	PIN Configuration	Function
1	VOUT1(+)	DC/DC Output
2	N.C.	No Connection
3	VOUT1(-)	DC Current return from LED bar
4	N.C.	No Connection
5	VOUT2(+)	DC/DC Output
6	N.C.	No Connection
7	VOUT2(-)	DC Current return from LED bar
8	N.C.	No Connection
9	VOUT3(+)	DC/DC Output
10	N.C.	No Connection
11	VOUT3(-)	DC Current return from LED bar
12	N.C.	No Connection
13	VOUT4(+)	DC/DC Output
14	N.C.	No Connection
15	VOUT4(-)	DC Current return from LED bar



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4.3 LVDS Interface

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- LVDS Receiver : Tcon (merged)

- Data Format (JEIDA & Normal)

	LVDS pin	JEIDA -DATA	Normal -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4	R0
	TxIN/RxOUT1	R5	R1
	TxIN/RxOUT2	R6	R2
	TxIN/RxOUT3	R7	R3
	TxIN/RxOUT4	R8	R4
	TxIN/RxOUT6	R9	R5
	TxIN/RxOUT7	G4	G0
TxOUT/RxIN1	TxIN/RxOUT8	G5	G1
	TxIN/RxOUT9	G6	G2
	TxIN/RxOUT12	G7	G3
	TxIN/RxOUT13	G8	G4
	TxIN/RxOUT14	G9	G5
	TxIN/RxOUT15	B4	B0
	TxIN/RxOUT18	B5	B1
TxOUT/RxIN2	TxIN/RxOUT19	B6	B2
	TxIN/RxOUT20	B7	B3
	TxIN/RxOUT21	B8	B4
	TxIN/RxOUT22	B9	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2	R6
	TxIN/RxOUT5	R3	R7
	TxIN/RxOUT10	G2	G6
	TxIN/RxOUT11	G3	G7
	TxIN/RxOUT16	B2	B6
	TxIN/RxOUT17	B3	B7
	TxIN/RxOUT23	RESERVED	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0	R8
	TxIN/RxOUT29	R1	R9
	TxIN/RxOUT30	G0	G8
	TxIN/RxOUT31	G1	G9
	TxIN/RxOUT32	B0	B8
	TxIN/RxOUT33	B1	B9
	TxIN/RxOUT34	RESERVED	RESERVED

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4.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																												GRAY SCALE LEVEL		
		RED										GREEN										BLUE										
		R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	G0	G1	G2	G3	G4	G5	G6	G7	G8	G9	B0	B1	B2	B3	B4	B5	B6	B7		B8	B9
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	-	
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	-	
	CYAN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	
	MAGENTA	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0	
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1	
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓ LIGHT	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1021
		0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1022
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1023
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0	
	DARK ↑	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1021
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1022
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1023
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0	
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B1020
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	B1021
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B1022
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	B1023

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

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5. Interface Timing

5.1 Timing Parameters (DE mode)

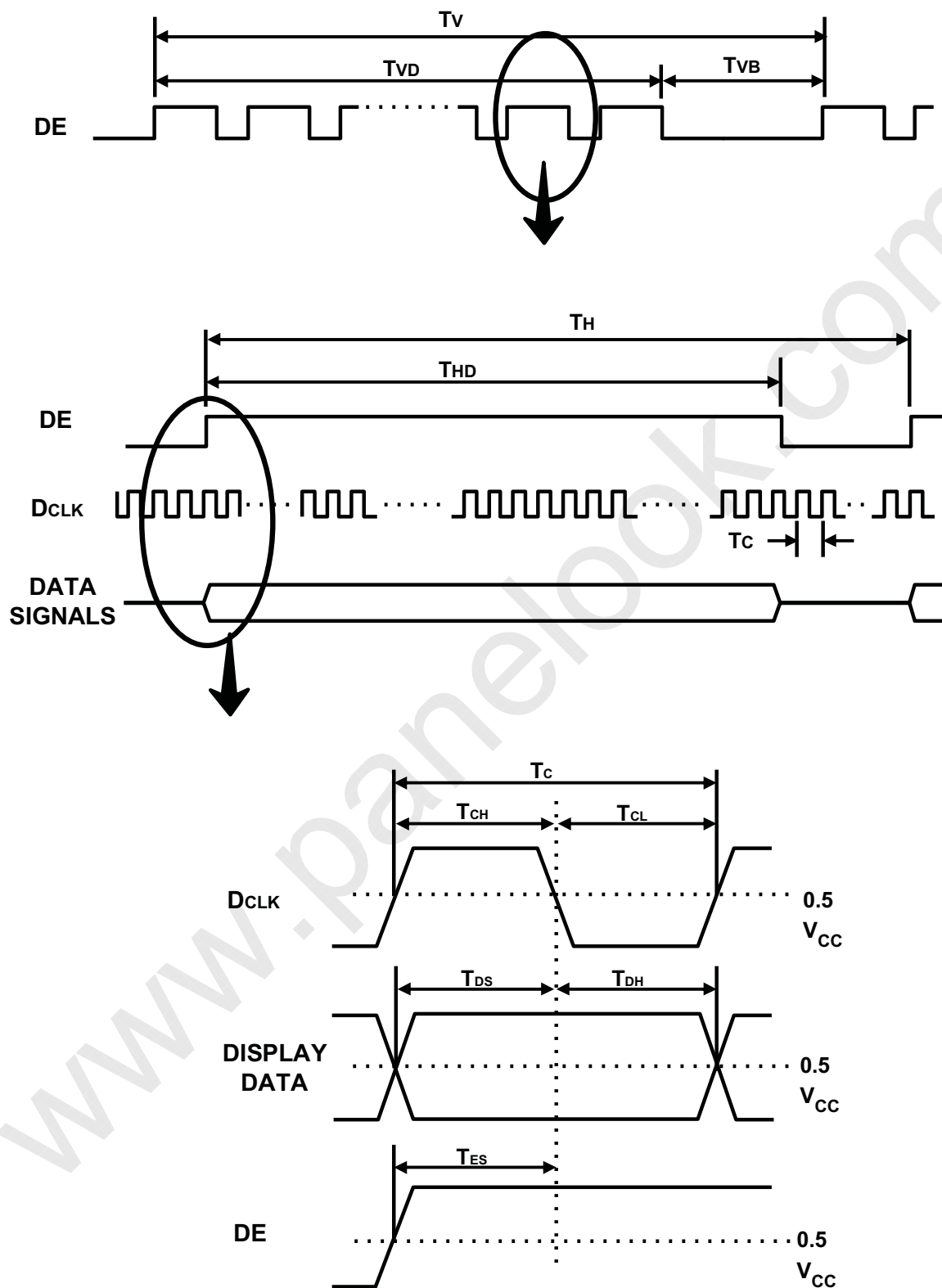
SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	260.0	297.0	305.0	MHz	-
Hsync		F_H	120.0	135.0	140.0	KHz	-
Vsync		F_V	95.0	120.0	125.0	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1092	1125	1380	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

Note) This product is DE mode. But the Hsync & Vsync signal must be inputted

- (1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
- (2) Internal VDD = 3.3V

5.2 Timing diagrams of interface signal (DE mode)

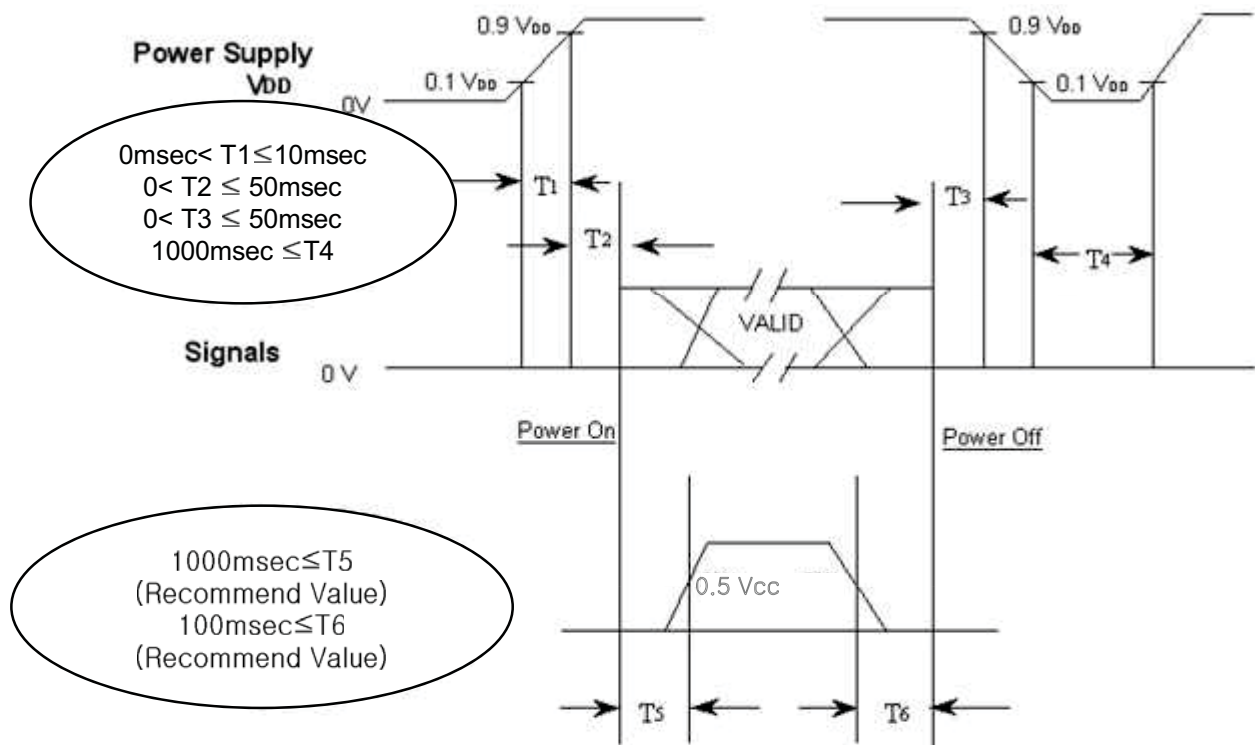
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5.3 Power ON/OFF Sequence

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To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



T1 : V_{DD} rising time from 10% to 90%

T2 : The time from V_{DD} to valid data at power ON.

T3 : The time from valid data off to V_{DD} off at power Off.

T4 : V_{DD} off time for Windows restart

T5 : The time from valid data to B/L enable at power ON.

T6 : The time from valid data off to B/L disable at power Off.

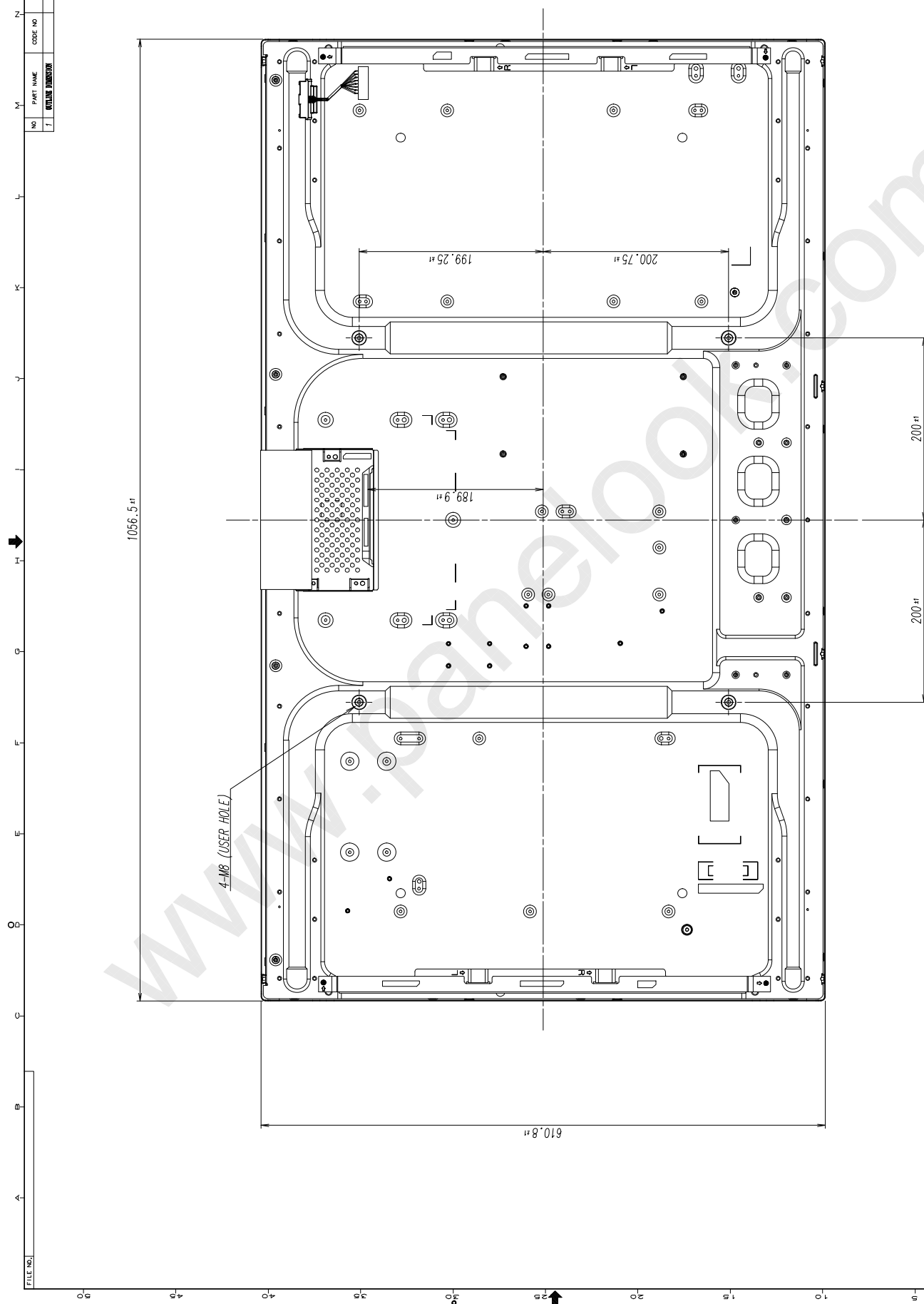
- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.
- In Case T5 is less than 1000msec and T6 is less than 100msec, Garbage Display can be seen. (It is not related to electrical function issue, Just for recommendation to prevent Garbage Display)



NO	PART NAME	CODE NO	SPECIFICATION	Q-TY	WEIGHT		P	REMARK
					FINISH	MATERIAL		
1	OUTLINE DIMENSION		17440811-701	1				

GENERAL TOLERANCE							REV. DATE				DESCRIPTION OF REVISION				MODEL NAME		PART/SHEET NAME		OUTLINE DIMENSION		SHEET 2/2		VER. 000		
STEP		LEVEL 1		LEVEL 2		UNIT		SCALE		1/2		TOLERANCE		LEVEL 1		LEVEL 2		DATE BY		CHK'D BY		APP'D BY		REASON	
0	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
1	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
2	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
3	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
4	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
5	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
6	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
7	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
8	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
9	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
10	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
11	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
12	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
13	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
14	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
15	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
16	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
17	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
18	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
19	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
20	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
21	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
22	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
23	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
24	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
25	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
26	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
27	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
28	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
29	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
30	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
31	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
32	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
33	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
34	± 0.5	± 0.5	± 0.5	± 0.1	mm																				
35	± 0.5	± 0.5	± 0.5	± 0.1	mm																				

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7. Reliability Test

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Item	Test condition	Quantity
Temperature Step Stress	-20 ~ 60℃, 40hr, 5 Cycle determination	4EA
HTOL	50℃, 500hr determination	4EA
LTOL	0℃, 500hr determination	4EA
HTS	70℃, 500hr determination	4EA
LTS	-30℃, 500hr determination	4EA
THB	40℃ / 95%RH, 500hr determination	4EA
WHTS	60℃ / 75%RH, 250hr determination	4EA
Thermal Shock	-20 ℃ ~ 60 ℃, 200cycle determination	4EA
ESD(operation)	contact : ± 8 kV ,150pF/330Ω ,200Point,1 time/Point non-contact : ± 15 kV,150pF/330Ω ,200Point,1 time/Point	3EA
Inverter Input Con. ESD	contact : ± 2kV,150pF/330,Input Con.Pin,3 times/Pin	3EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	Half Sine, 11msec, ±X,Y 40G, ± Z 30G 1time/axis	3EA
PALLET Vibration	1.05Grms 5~200Hz 1hr	1PALLET(15EA)
PALLET Drop	4 edge 1face(bottom) 20 cm	1PALLET(15EA)

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

- * HTOL/ LTOL : High/Low Temperature Operating Life
- ** THB : Temperature Humidity Bias
- *** HTS/LTS : High/Low Temperature Storage
- **** WHTS : Wet High Temperature Storage

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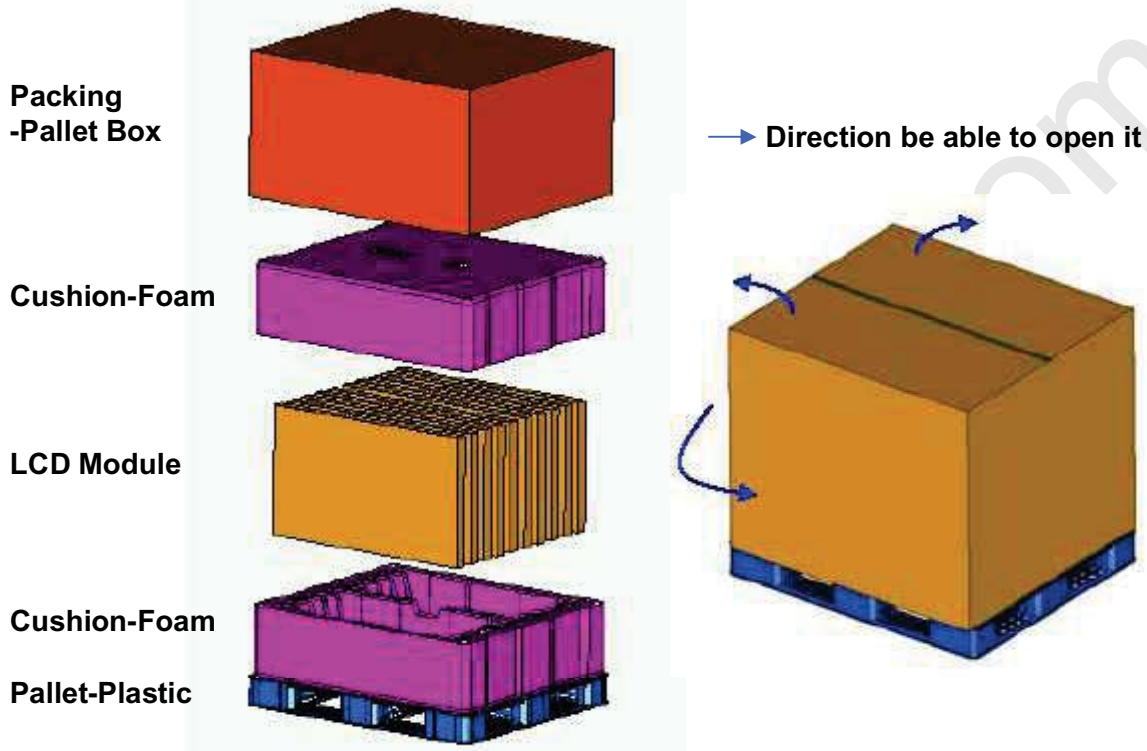
8. PACKING

8.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



8.2 Packing Specification

Item	Specification	Remark
LCD Packing	15ea / (Packing-Pallet Box)	1 11.3 Kg / LCD (15ea) 2. 12 Kg / Cushion-pallet (2ea) 3. 8 Kg / Packing-Pallet Box (1ea) >. Cushion-pallet Material : EPS >. Packing-Pallet Box Material : DW4
Pallet	1Box / Pallet	1. Pallet weight = 8.8kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1270 mm(H) x 1150 mm(V) x 844mm(height)
Total Pallet Weight	194.5 kg	Pallet(8 kg) + Module(11.1*15=166.5kg) + Cushion(up+bottom=12kg) + Pallet-BOX(8kg)

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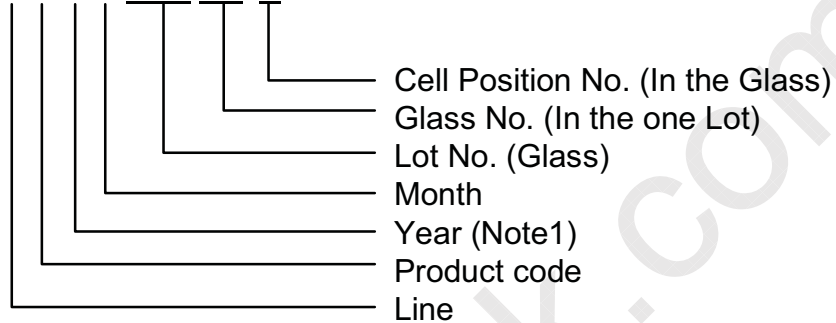
9. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

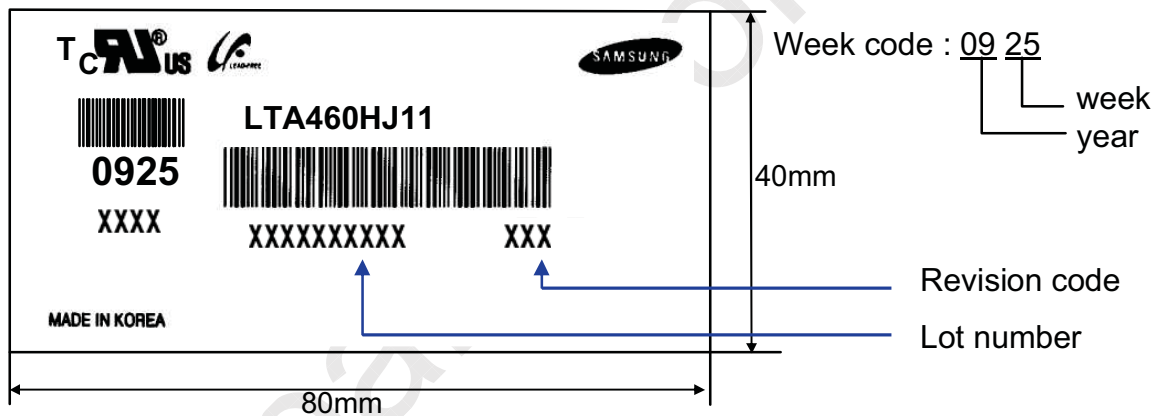
(1) Part number : LTA460HJ11

(2) Revision: Three letters

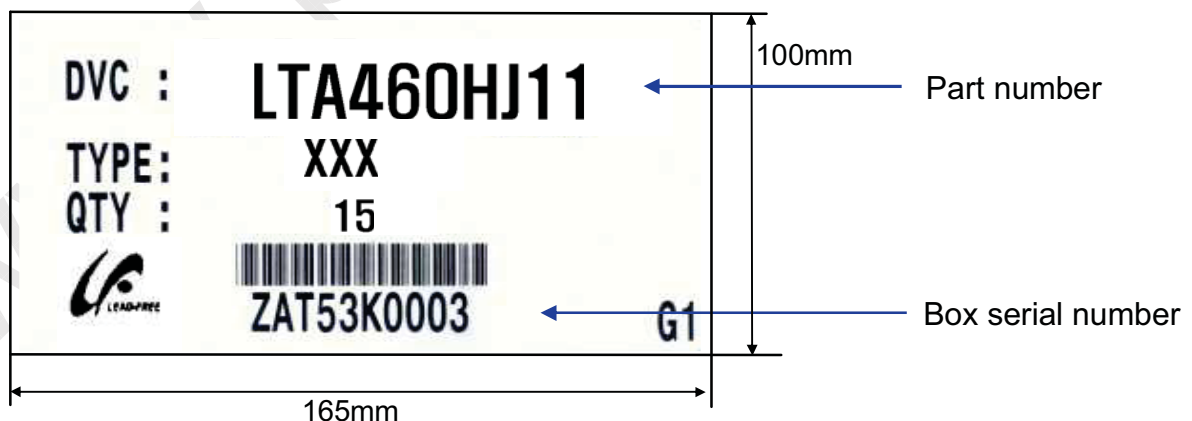
(3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



(6) Others

1. After service part

Lamps cannot be replaced because of the narrow bezel structure.

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10. General Precautions

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10.1 Handling

- (a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.
- (b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.
- (c) Refrain from strong mechanical shock and / or any force to the Module.
In addition to damage, this may cause improper operation or damage to the Module and CCFT back light.
- (d) Note that polarizers are very fragile and could be damage easily.
Do not press or scratch the surface harder than a HB pencil lead.
- (e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.
- (f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.
- (g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.
- (i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or semiconductor would be damaged.
- (j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (k) Do not disassemble the Module.
- (l) Do not disassemble shield case of inverter & LVDS board
- (m) Do not connect N.C pins. (Samsung internal use only)
- (n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handling a module
- (o) Pins of I/F connector should not be touched directly with bare hands.

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10.2 Storage

- (a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 0 to 35℃ and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD Module in direct sunlight.
- (c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

10.3 Operation

- (a) Do not connect or disconnect the Module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the "Power on/off sequence"
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of LED and may require higher startup voltage(Vs).

10.4 Operation Condition Guide

- (a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
 - Temperature : $20 \pm 15^{\circ}\text{C}$
 - Humidity : $55 \pm 20\%$
 - Display pattern : continually changing pattern (Not stationary)
- (b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

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10.5 Others

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- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.
- (d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.
- (e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.
- (f) Please contact SEC in advance when you display the same pattern for a long time.

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MATERIAL LIST_ LTA460HJ11-T01

	Parts	Name of Material	Type NO.	Manufacture	Spec	Flame Class	UL File No.
1	ASSY CHASSIS-TOP						
1-1	CHASSIS-TOP (U)	SGLCC		POSCO	T0.8	-	
1-2	CHASSIS-TOP (D)	SGLCC		POSCO	T0.8	-	
1-3	CHASSIS-TOP (L)	SGLCC		POSCO	T0.8	-	
1-4	CHASSIS-TOP @	SGLCC		POSCO	T0.8	-	
1-5	SPACER-TOP(U/D)	PORON	TROS+DSS-703AD	아진	T0.3	-	
1-6	SPACER-TOP(L/R)	PORON	TROS+DSS-703AD	아진	T0.3	-	
1-7	INSULATION-TOP	PET		SKC	T0.1	-	
2	ASSY PANEL						
2-1	SPACER-PANEL	SILICON	SH0140U+AT-9351K	KCC+TAPEX	T0.3	HB	E98818
3	FRAME-MOLD MIDDLE	PC+ABS+G/F15%	JH-R2G15	KINGFA	BLK	V2	E115797
3-1	SPACER-MIDDLE	PET	SB00/AT-9351K	SKC/애니테일	T0.3	VTM-2	E74359
3-2	TAPE-PET	PET	136ONH-B(D)	3M	T0.05	UL 510	E166244
4	SHEET-RP	PET	DBEF-D2-400	3M	T0.4	-	
5	SHEET-PRISM	PET	MAS 670M(TILT 3°)	제일모직	T0.3	-	
6	SHEET-DIFFUSER	PET	UTE23-10B	SKC	T0.3	-	
7	LGP	PMMA	AP202	FS	T3.5	-	
7-1	TAPE-DOUBLE FACE	TAPE	SWT-802FY	GST	T0.1	-	-
8	SHEET-REFLECTOR	PET	SLP7-15R	신화인터텍	T0.33	-	E206562
8-1	SCREW			C10S	M2.6*L14	-	-
8-2	SCREW			동부제강/3M	M3*L6	-	-
8-3	SCREW			동부제강+한진금속	M1.6*L4.5	-	-
9	ASSY LED	LED	62LED, 10PIN, WLED	삼성엘이디		-	-
10	TAPE-THERMAL	TAPE	3M 670SA	3M	T0.2	V-2	E239181
11	Assy Chassis-bar						
11-1	CHASSIS-BAR (U)	AL	AL6063	동양강철	T2.0	-	-
11-2	CHASSIS-BAR (D)	AL	AL6063	동양강철	T2.0	-	-
11-3	SPACER-CHASSIS BAR	PORON	PSR+TERAOKA 7641	SNK폴리텍/TERAOKA	T2.0	-	-
11-4	CHASSIS-BRAKET	SECC		포스코	T1.5		
11-5	TAPE PET	PET	3357FR	3M	T0.07	UL 510	E166244
11-6	HOLDER-WIRE	SILICON	HR1961U	HRS	DARK-GRAY	HB	E98818
11-7	ASSY LEAD CONN						
11-8	WIRE	XPLO	UL10368-HF_P 1X28AWG	LS Cable		VW-1	E52853
11-9	HOUSING	GN1001BF/XFR4840	SMH200-15/SFVR-02V-S(HF)	연호/JST		94V-0	E108706/E60389
11-10	TERMINAL	C5191/C5210	YST200/SGVH-002T-P0.2	연호/JST		-	-
11-11	TUBE	Polyolefin Compound	A2HF 4.0mm(RED)/2.0mm(BK)	삼화KDK		VW-1	E58072
12	CHASSIS BOTTOM	AL	SN205	노벨리스코리아	T1.0	-	-
13	Control PBA					-	-
14	SHIELD CASE-CONTROL	SECC		노블레스	T0.6	-	-
14-1	SCREW			동부제강/3M	M3*L4	-	-
14-2	LABEL BAR CODE B/L	NY지		한국코스틱	WHT	-	-
15	ASSY COVER-CONTROL						
15-1	PET FILM	PET	SH94	SKC	T0.1	VTN-2	E74359

Items		Type name Current	Type name New
Glass	Panel Structure	Cell Ver.	1G1D/MB4
	CF PR	CF & PR Ver.	SPR5
	LC	Maker, Type	C5
	POL	Maker, Type	Nitto/Sumittomo/4G-NTAC(From ES)
BLU	Outline	(FMB)	23mm
			1056.5*610.8*10.8
	Lamp	Maker,	S-LED
	LAMP Pitch	Maker, ϕ **, **Torr, **pcs	SSC/62*4
	Sheet	Maker, type name,	3M/DBEF/0.4T
	Reflector Sheet	Maker, type name,	SHINWA/SLP7-15R/0.4T
	Diffuser Sheet	Maker, type name,	SHINWA/PTR873/0.3T
	Diffuser Sheet	Maker, type name,	CHEIL / MAS / 0.3T
	Diffuser Plate	Maker, type name,	BAOS/PMMA/3.5T
	Bottom Chassis	Material, Thickness	AL/1.0T
	Top Chassis	Material, Thickness	SGLCC/0.8T
	Gate IC	***ch x *pcs	ASG
	Source IC	mini-LVDS, ***ch x *pcs	AiPi+/966ch/6pcs (LDI)
	Source PCB	Size, Material, Layer	499*15*2ea/ ISU&Tripod/4layer
ELECRI	Control PCB	Size, Material, Layer	149*75/ ISU&Tripod /4layer
	T-con ASIC	Type name	S120B
	Memory	memory size, Quantity	eDRAM

대외비

2009-04-28 / 이승일 / 응용기술 3파트 / 보존기한:3년

	Silk name	品名	Pd max	Theta jc	Pd*Theta jc	Tjmax	Tjmax x 80 %	Tc Spec
Panel	Panel Surface	Left Top of Surface	-	-	-	60 (MAX)	-	-
Control B/D	IC18	IC-VOL Generator	0.99	2	1.980	150	120	118.0
	IC592	IC-SWITCH VOL.REG.	0.730	1.5	1.095	150	120	118.9
	ICD1	IC-DC/DC CONVERTER	1.800	2.2	3.960	150	120	116.0
	IC591	ASIC	0.859	8.90	7.645	150	120	112.4
	OP2	IC-OP AMP	1.65	0.88	1.452	150	120	118.5
	IC1	IC-OP AMP	1.951	0.80	1.561	150	120	118.4
	IC2	IC-OP AMP	1.951	0.80	1.561	150	120	118.4
	IC3	IC-OP AMP	1.951	0.80	1.561	150	120	118.4
	IC4	IC-OP AMP	1.951	0.80	1.561	150	120	118.4
	IC41	IC-EEPROM	0.72	1.2	0.864	150	120	119.1
	IC5	IC-MODULATOR	0.08	1	0.080	125	100	99.9
	ICE1	EAGLE IC	1.330	2.06	2.740	150	120	117.3
	SOURCE D-I.C	1	1.4	1	1.4	125	100	98.6
SOURCE								

LTA460HJ11 Explode View

